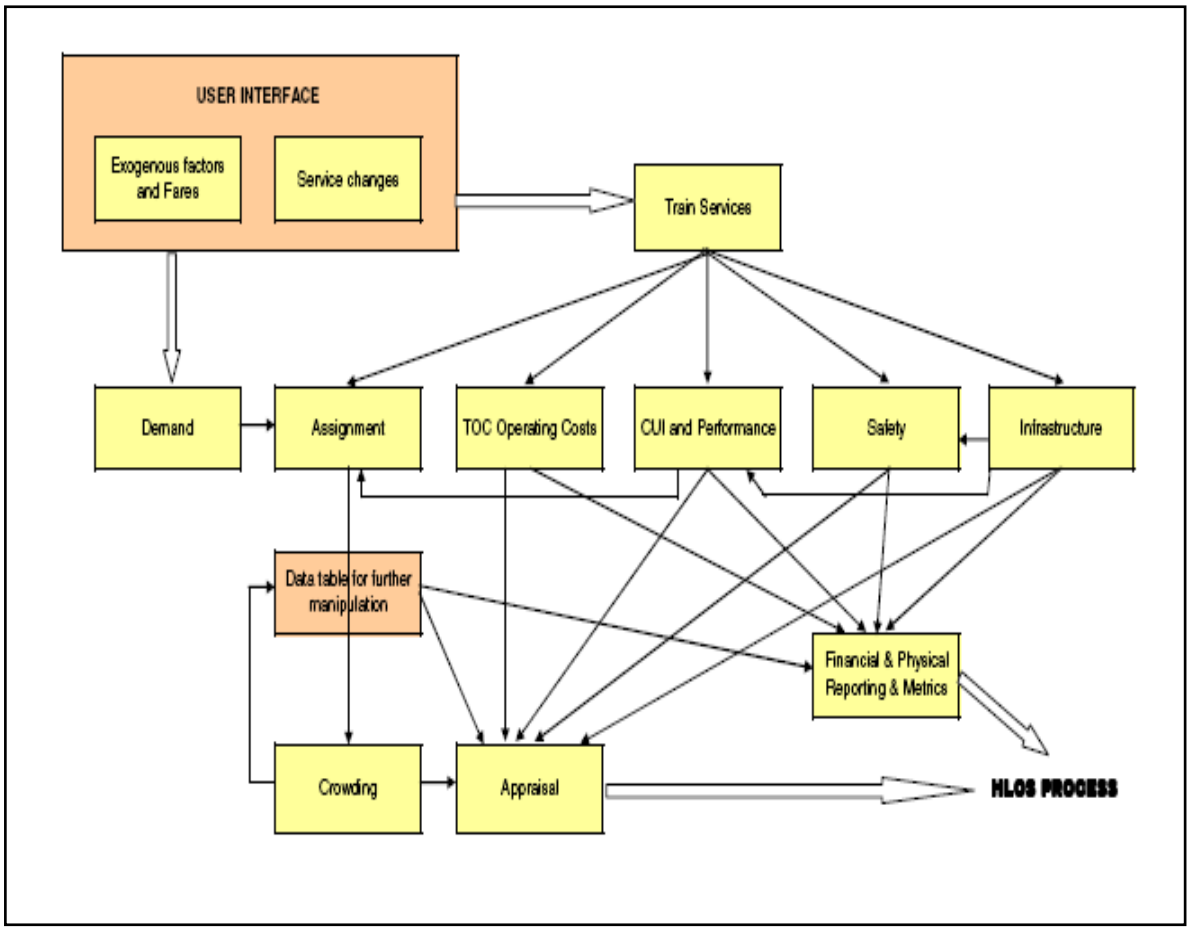
TEG TRANSPORT ECONOMISTS' GROUP

The Transport Economist

The Journal of the Transport Economists' Group



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TEG TRANSPORT ECONOMISTS' GROUP

The High Level Output Specification (HLOS) and the Network Modelling Framework (NMF)

Tom Worsley & Preetum Domah

Rail Network Analysis and Modelling Division, Department for Transport

Arup

25 June 2008

INTRODUCTION

The Department for Transport's High Level Output Specification for railways (HLOS) was published as part of the July 2007 White Paper "Delivering a Sustainable Railway". HLOS is a major step as it specifies both the outputs that the Government will buy from the railways and the level of funding available over the forthcoming Control Period (April 2009 to March 2014). The HLOS represents the first part of the government's long term rail strategy. It is defined by the following metrics:

- Capacity: load factors, passenger kilometres
- Performance: Public Performance Measure (PPM) reflecting both punctuality and reliability
- Safety: Fatalities and Weighted Injuries (FWI) for staff, normalised by workforce hours, and passengers, normalised by passenger kilometres

The HLOS is costed by the Office of Rail Regulation (ORR) and delivered by Network Rail and through franchises. Under the Railways Act, the metrics are the deliverable, and the industry is not obliged to deliver them in the way assessed by DfT.

Modelling rail is made difficult by the absence of a detailed national OD matrix of trips by rail and by other modes. The National Travel Survey provides one source but the representation of rail is sparse as rail represents only 2% of all trips. However there is a comprehensive station to station ticket based database. The industry standard demand model takes this database, forecasts demand and assigns it to trains through:

- Exogenous/endogenous drivers of demand in the base and forecast years and elasticities for each driver/demand category.
- Assignment to trains using time profile and generalised time. Crowding is a key policy issue and can be modelled in detail.

On the supply side, the model uses:

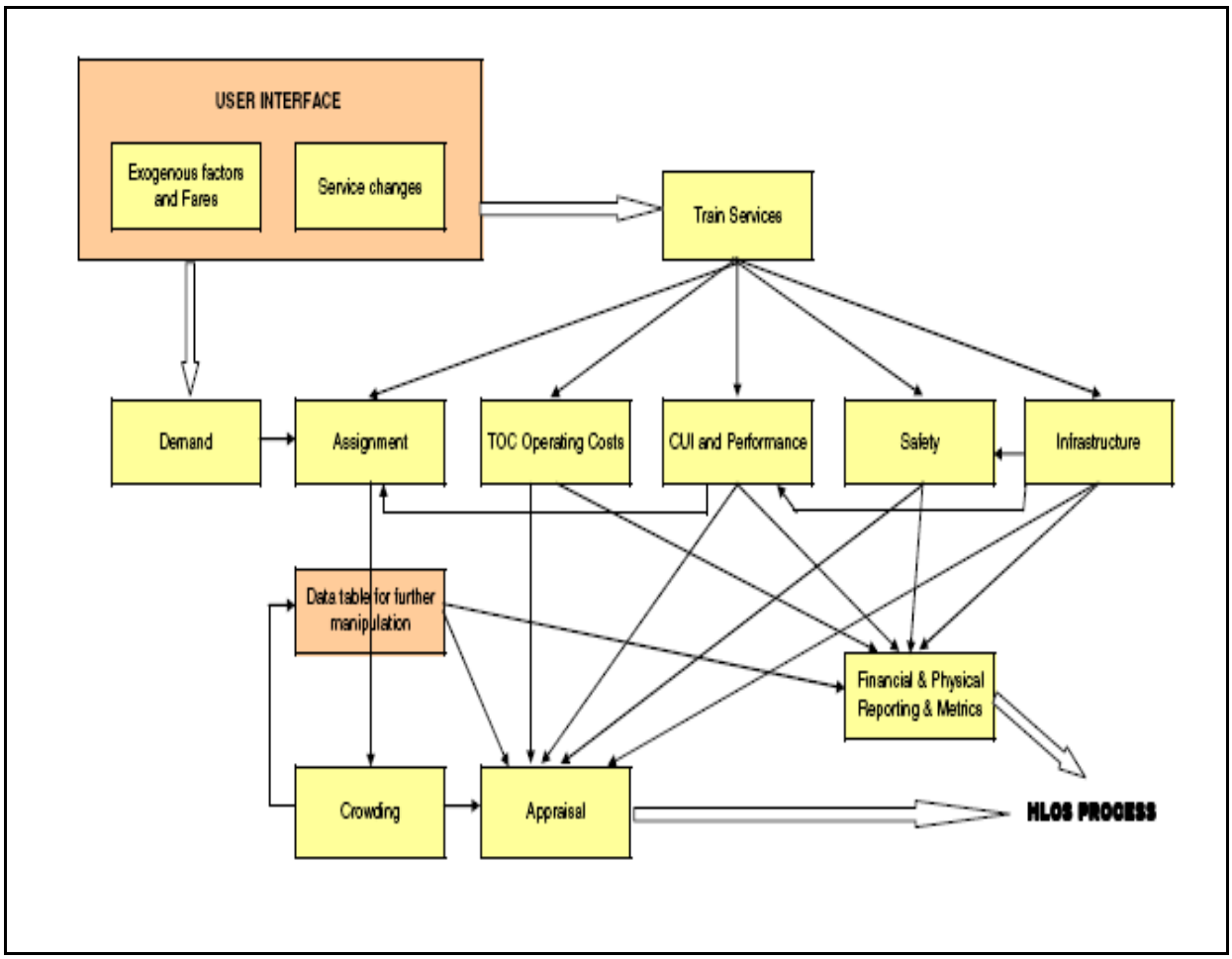
- Train operating costs and incremental infrastructure operation, maintenance and renewal costs
- Train timetable and capacities, inputs which influence demand
- Performance and reliability, modelled at a very aggregate level: the model cannot show whether there is capacity for an extra train

The Network Modelling Framework (NMF) is strategic. It covers the whole network, but allows examination of local issues such as loading and overcrowding:

- Estimates HLOS metrics/outputs, value for money and costs
- Demand modelled on about 550 demand zones. There are 2,500 stations on the network so smaller stations are grouped with principal stations (this was necessary to prevent the model form getting unmanageable but resulted in problems when assigning passengers between stopping trains and faster trains and will need refinement).
- Network/infrastructure is split into 300 sections reflecting route classification, funding boundaries and where there are significant changes in the type or volume of traffic on the network.
- Crowding is modelled by service group.

The model structure is shown overleaf.

The TOC Operating Costs Model forecasts unit operating costs based on trends in unit input costs and changes in inputs. Cost forecasting needs to be improved. Cost changes are estimated in response to changes in outputs or scenarios appropriate to marginal but not step changes in costs. Train service derived metrics (train miles, service hours, etc,) are used to drive changes in costs by TOC and train/rolling stock type. The main cost categories are staff, lease, maintenance, fuel.



The Infrastructure Cost Model (ICM) was developed by Network Rail which also supplied the inputs to the model. It estimates the Operations, Maintenance and Renewal (OMR) costs for differing specifications of network usage. The basic functionality is that asset information (7 categories) and the passage of time/traffic or renewals policies determines the volume of activities. This is multiplied by unit costs to give O, M and R costs. The cost of enhancements is dealt with off-line but ICM estimates additional traffic impact on existing network.

The Performance Model was also developed by Network Rail:

- It uses relationship between capacity utilisation and performance to understand how changes in network usage affect performance.
- Performance is determined by the number trains, their reliability and the expenditure on infrastructure.
- Management response and action is not included.
- Outputs comprise HLOS Public Performance Measure (PPM) metrics by sector and feed back to demand and value for money.

The Safety Model is a probability-based model developed by RSSB which takes account of:

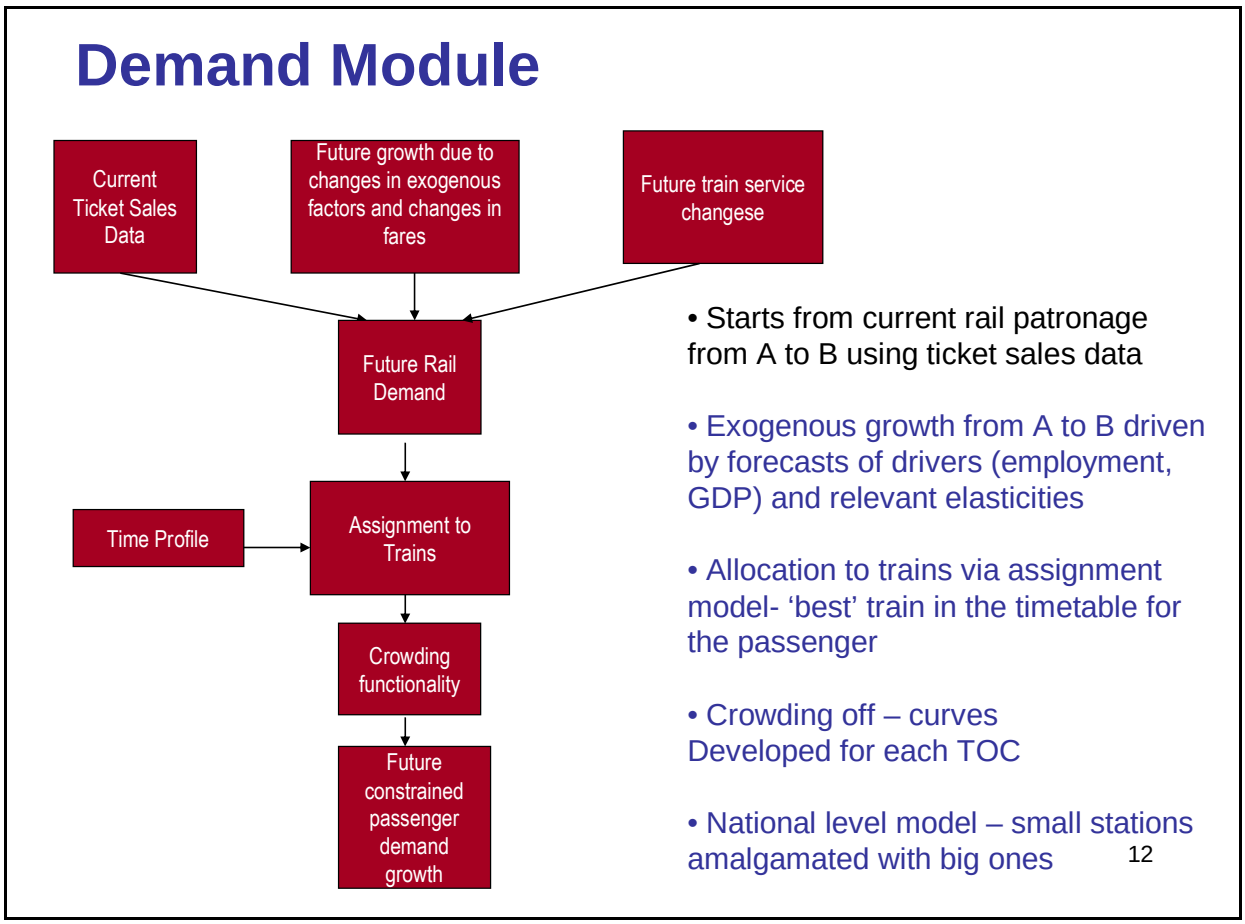
- Trains operated and potential hazards
- Uses
    - Fault trees (hazardous events, occurring at a certain probability)
    - Event trees (different scenarios within each event, with a probability and predicted number of casualties)
- Output is changes in Fatalities and Weighted Injuries per Year

The Environmental Model was developed by DeltaRail

- It is made up of two separate MS Access models, the emission model and the noise model
- The emission model estimates for each passenger train on the British rail network
    - Fuel consumption
    - Emissions of NO_x, PM_{10}, SO_2 and CO_2
    - Externality costs of emissions
- The Noise Model estimates for each strategic route
    - Noise emissions
    - Externality cost of a change in the rail service

DfT has used the emissions model in estimating a carbon trajectory for rail in its submission to the Committee for Climate Change and in estimating the welfare costs of changes in CO_2 from the HLOS options.

The structure of the demand model is shown overleaf. On the majority of lines into London, the implementation of HLOS should result in 2014 load factors better or no worse than those in 2007, despite growth in peak 3-hour demand of between 12% and 20% and even higher growth at some stations where major improvements were planned, such as Thameslink or Kent Express services to St Pancras. Load factors should similarly be no worse than in 2007 in other major urban areas.



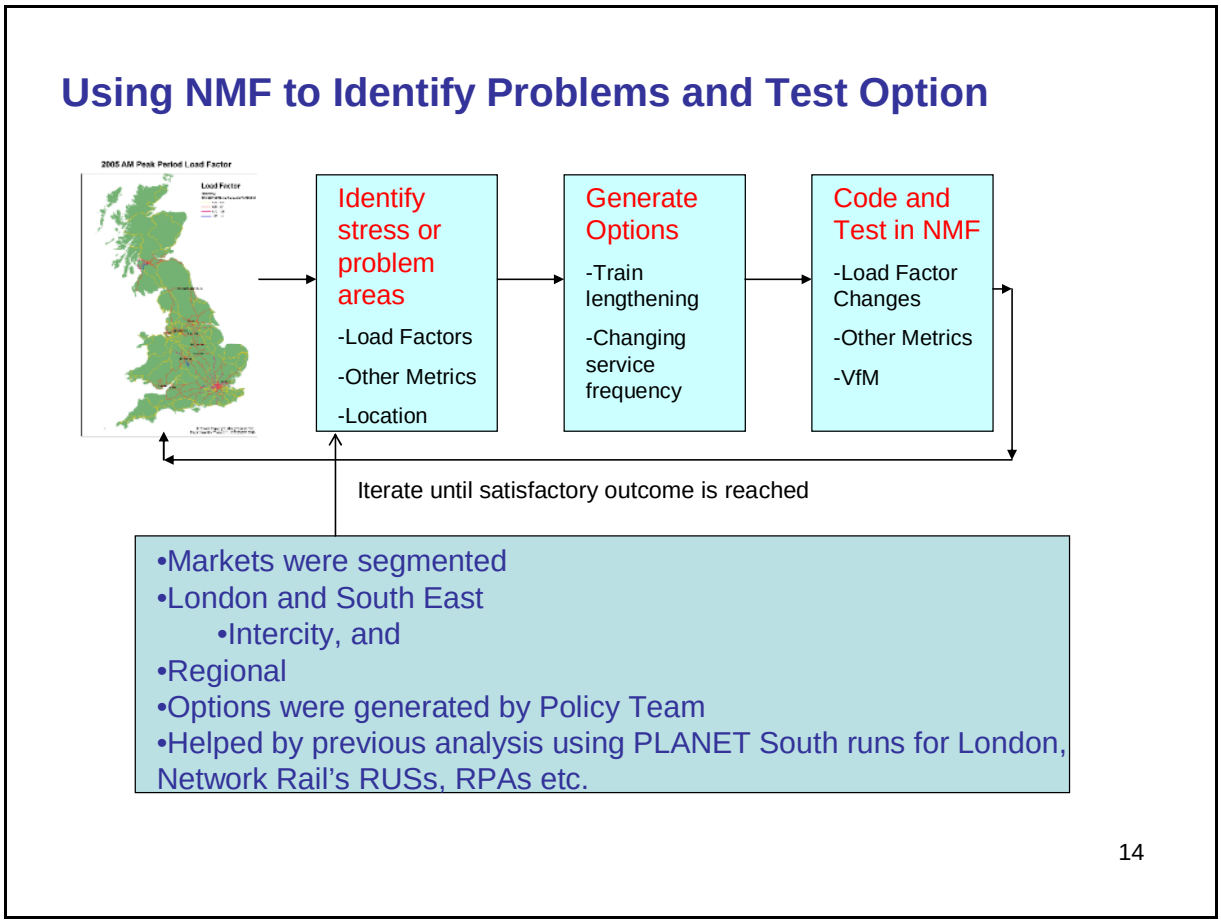
For HLOS, DfT tested the following Options:

- Train lengthening
- Timetable changes
    - Changes to train frequency
    - Journey time changes

The NMF outputs for HLOS were:

- Crowding and Demand – Passenger km and peak demand to be accommodated
- Safety – reduction in risk (FWI) for passengers and workers
- Reliability – improvements in Passenger Performance Measure (PPM) by sector
- Appraisal (Value for Money)

The diagram below shows how the NMF is used to identify problems and test options.



On Safety, the metric is a 3% reduction in the national level of risk to passengers and rail workers from 2008/9 to 2013/14, based on the Safety risk module plus judgement on non-modelled risk and initiatives.

On Reliability, the PPMs to be achieved by 2013/14 are 92% for long distance and regional and 93% L&SE, with reductions of 21-36% in significant lateness. These are based on the Performance module plus judgement on management initiatives and significant lateness.

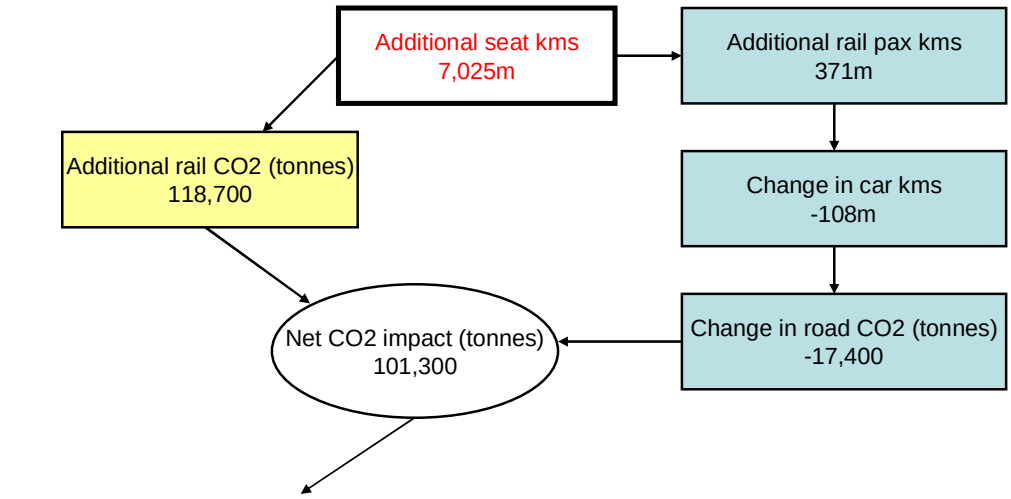
On capacity, the metrics were:

- Total demand by Strategic Route, based on NMF forecasts of additional passenger kilometres in 2008/9 estimates. This metric encapsulates the government's expectation of continuing traffic growth but is too broad and general for the NMF to be able to show how it could be delivered or for the ORR to cost it.

- Load factors, in London and other urban areas, a metric based on NMF forecasts and which could be validated by the ORR.

The diagram below shows the impact on CO_2 emissions of the additional 7 billion seat kilometres which provide the way identified in the NMF of meeting the HLOS load factor metric. The train diagrams that the additional stock was assumed to operate resulted in an increase in seat-kilometres operated of around 20 times the additional passenger-kilometres generated, because the main aim of the policy was to reduce crowding rather than to generate rail demand. As a consequence, emissions per additional passenger-kilometre for this increase in capacity are around 6 times greater than the average and the overall increase in rail emissions is greater than any offsetting reduction on the highways network through mode shift.

HLOS – CO2 impact decomposition (2014)



Rail emissions	CO2g per pax km	CO2g per seat km
Average	54	20
Marginal	319	17

Train lengthening causes an increase in CO_2 emissions although the average is low.

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Results

The appraisal of HLOS showed the results tabulated below.

Benefits	+£1,172m	Time savings (£671m rail, £501m highway)
	+£5,937m	Crowding relief
	+£1,569m	Generated rail revenue
Costs	-£4,061m	operating costs
	-£110m	loss in bus revenue
	-£272m	tax revenues (reduction in fuel tax collected
	-£80m	greenhouse gases
	-£37m	local air quality
	-£1,708m	investment enhancement costs
Total NPV	+£2,409m	(1.54:1 BCR)

All are 2002 present values, over an appraisal period from 2009/10 to 2068/69, with demand capped in 2025/26. The importance of crowding relief benefits arising form train lengthening was noted.

Current Challenges

Validation:

- Data?
- NMF outputs and comparability with Counts database
- Are forecasting parameters correct in current models?

Zoning

- What level of aggregation
- Issues of Assignment
- Mapping of zones in NMF modules

- Disaggregation vs. model run-time

Modelling conurbations, including London

- PTE and major cities
- Issue of zoning
- Interaction with Interurban services and the modelling challenge
- Urban models – poor representation of rail demand

Modelling cost

- TOC Costs
- Infrastructure Costs

MOIRA Replacement and PDFH Updating

- Parameter Updates
- Methodological changes
- Functional changes to current MOIRA

Environmental Assessments and Valuation

- Modelling fuel consumption by rolling stock
- Noise impacts
- Enhancing the NMF Environmental module.

What will be the future policy tests?

- Road pricing
- Differential Fares
- Towards a Sustainable Transport System or TaSTS (October 2007 Paper) implementation.

Metrics versus Value for Money (VfM)

- Crowding Metric – need there be a threshold level for assessment?

- Performance forecasting, current modelling capability – very high level
- Metrics not always in line with VfM criteria
- Management initiatives not currently modelled

On being asked whether metrics would necessarily deliver VfM, the speakers replied that they provided an output that could be monitored and audited and that, ideally, metrics should be set with regard to value for money, which lacked a clear audit trail.

The NMF Development Plan focuses on data, methodology, functional and model efficiency, requirements of the model:

- Testing NTM/NMF Integrated Model
- Replacement of the RIFF-Lite Forecasting Tool
- Review of Zoning and Aggregation
- TOC Cost modelling
- Working Closely with MOIRA Replacement and PDFH Updating
- Model Updating – Baseline, ICM2, etc
- Model run using a CITRIX Environment
- Development of the Environmental Module
- Reviewing other models to understand how NMF can be improved (e.g. PLANET and NEM)

QUESTIONS

Peter Gordon (DeltaRail) asked if the NMF would allow different zones for different models or more detailed modelling in local sub-models. DfT are looking at this but they need to match zones between the demand module and the modules which make use of the 300 strategic route sections.

David van Rest asked what accuracy is expected from the model. The speakers said the model was quite a good predictor at the aggregate level but that it is not good at predicting individual train loadings. It

served the purpose of defining the metrics and the funding requirements, both of which are high level outputs.

Andrew Evans (Imperial College) asked whether there were any safety benefits. The speakers said that safety benefits had been analysed on a consistent basis but that the benefits were small compared with others.

Martin Higginson (Independent) asked about the impact on freight. The speakers said freight was not the focus of this exercise as HLOS concerns what the Secretary of State is purchasing and she is not purchasing improvements to freight. There are however assumed grandfather rights for freight based on 2005 levels. DfT is looking at freight separately.

Stephen Burke (Bexley Council) asked if DfT had obtained on/off data for trains. DfT are trying to obtain this data although it is not available from all fleets.

Stephen Plowden (Freelance) suggested that, by assuming London growth and catering for it, the predictions are self-fulfilling. He added that crowding might result in a switch to coaches or home working rather than to car. The speakers said the task was to set up a model to reduce crowding, which was complex enough, and did not include a review of London employment.

Gwyn Rowlands (DeltaRail) asked about the application of HLOS to High Speed Rail and other major schemes. The speakers said the DfT is looking at the problem of connectivity between cities and are carrying out a Feasibility Study into a long distance multi modal model.

John Segal (MVA) asked if DfT has compared assumed traffic growth rates with those in franchise bids. The speakers said the bids are little higher but this reflects their competitive nature. The model is based on the Passenger Demand Forecasting Handbook which is generally accepted by the industry for strategic forecasting and modelling purposes.

Gregory Marchant (Retired) noted that the 1968 Act had established a link between subsidies and individual services and that this had only lasted eight years. He asked (rhetorically) how long the speakers expected HLOS to last.

Report by Jeremy Drew

System Dynamics

John Swanson

Associate, Steer Davies Gleave

Arup

24 September 2008

THE SPEAKER

John Swanson outlined his background in mathematics and operational research. He learned economics “on the job” during his career, which began at BAA and then London Transport before moving to consultancy around 20 years ago. He has worked widely on technical and modelling projects and on Stated Preference (SP), and was a contributor to a book of the subject, sponsored by the Department for Transport. His recent focus has been on how transport affects the economy using urban simulation models based on ideas from System Dynamics, the subject of his talk this evening.

SYSTEMS DYNAMICS

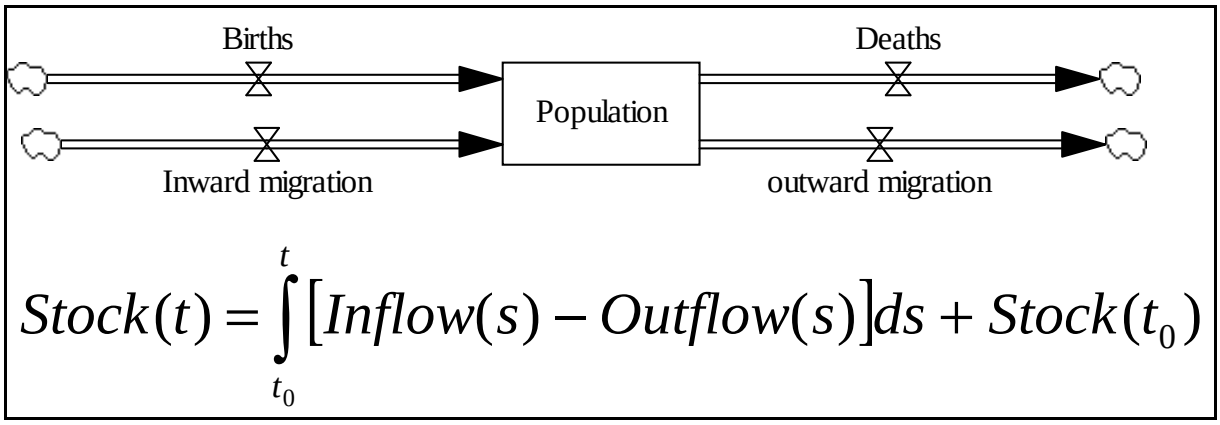
Systems Dynamics (SD) is a simulation technique showing how systems change through continuous time. It originated in the 1950s and led to several books which were influential in the following decades including:

- “Industrial dynamics”, published in 1961 and still in print
- “Urban Dynamics”, describing urban simulation techniques applied in the eastern USA and arguing against the housing programmes of the time on the grounds that they did not provide the basis for economic regeneration and employment.
- “World Dynamics”, following in 1972 by “The Limits to Growth” examining not only social and economic but also ecological constraints.

After a period of high public visibility and controversy, SD later retreated to the academic world until the 1990s, when the growth in computing power enabled the creation of software which could be run on PCs, and its use subsequently grew among management consultants.

The key variables are stocks and flows, or integrators and rates of change. One of the merits of the approach, and of the software packages used for it, is the effective use of diagrams to set out the structure of a model and clearly show the chains of causes and effects. Unlike many conventional economic and equilibrium models, SD naturally handled feedback, a situation where decisions made at one point in time affects conditions which would later alter how those same decisions would be made in the future. One example was how cars may be attractive now, but their adoption causes congestion which reduces their future attractiveness.

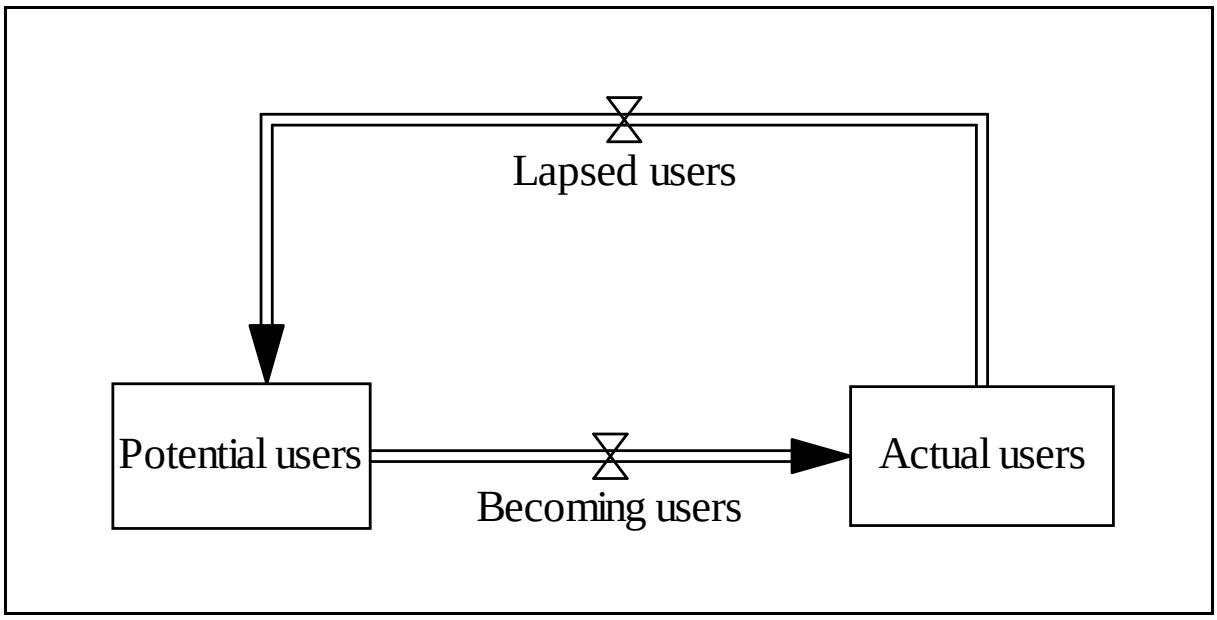
He provided simple illustrations of the distinction between stocks such as population and flows such as births, deaths and inward and outward migration, as shown in the figure below. Each can be fixed or controlled by a “valve” which might in turn be controlled by other stocks and intermediate variables. The simulation software handles the integration over time of the flows which determine each stock.



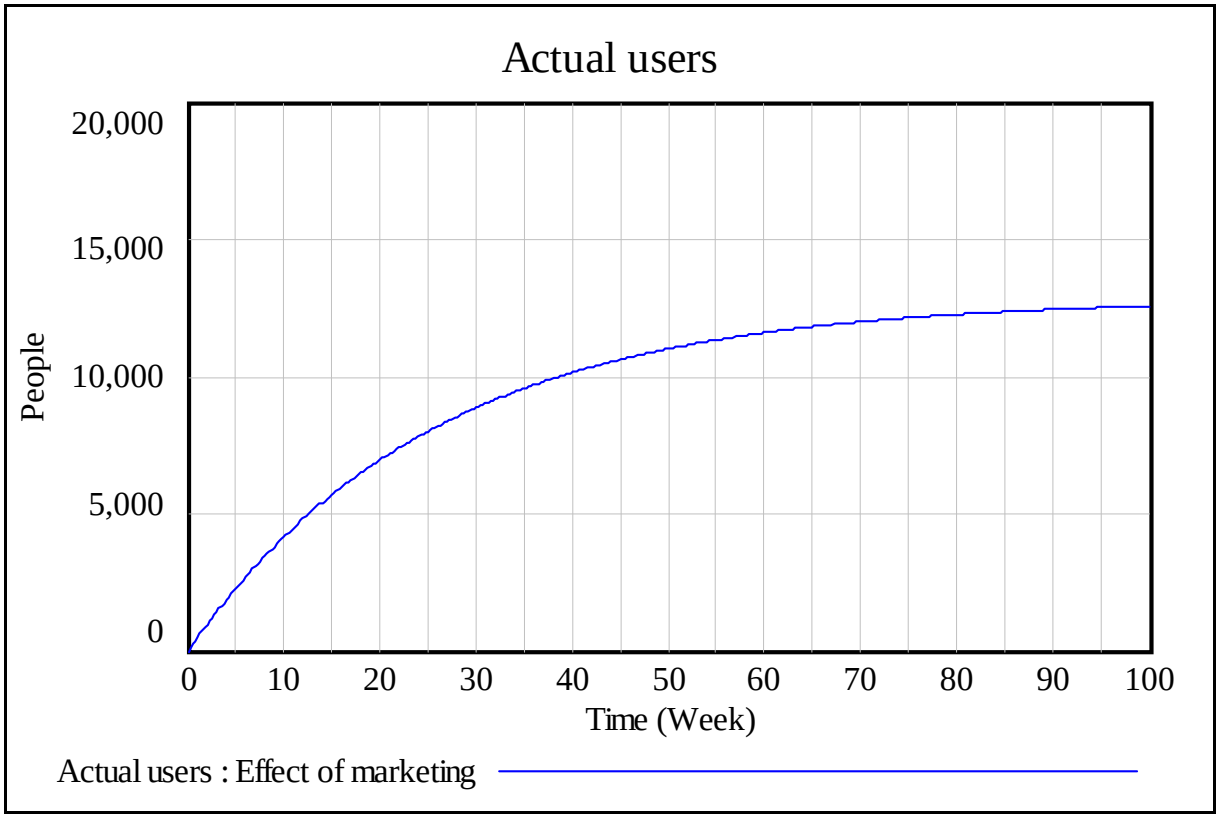
$$Stock(t) = \int_{t_0}^{t} [Inflow(s) - Outflow(s)]ds + Stock(t_0)$$

The usefulness of SD lies in the fact that many dynamic systems can be viewed as consisting of stocks and flows. Examples include population, materials, infrastructure, money, information and even travel preferences and behaviour. Flows can be adjusted in response to circumstances as individuals in the system make choices.

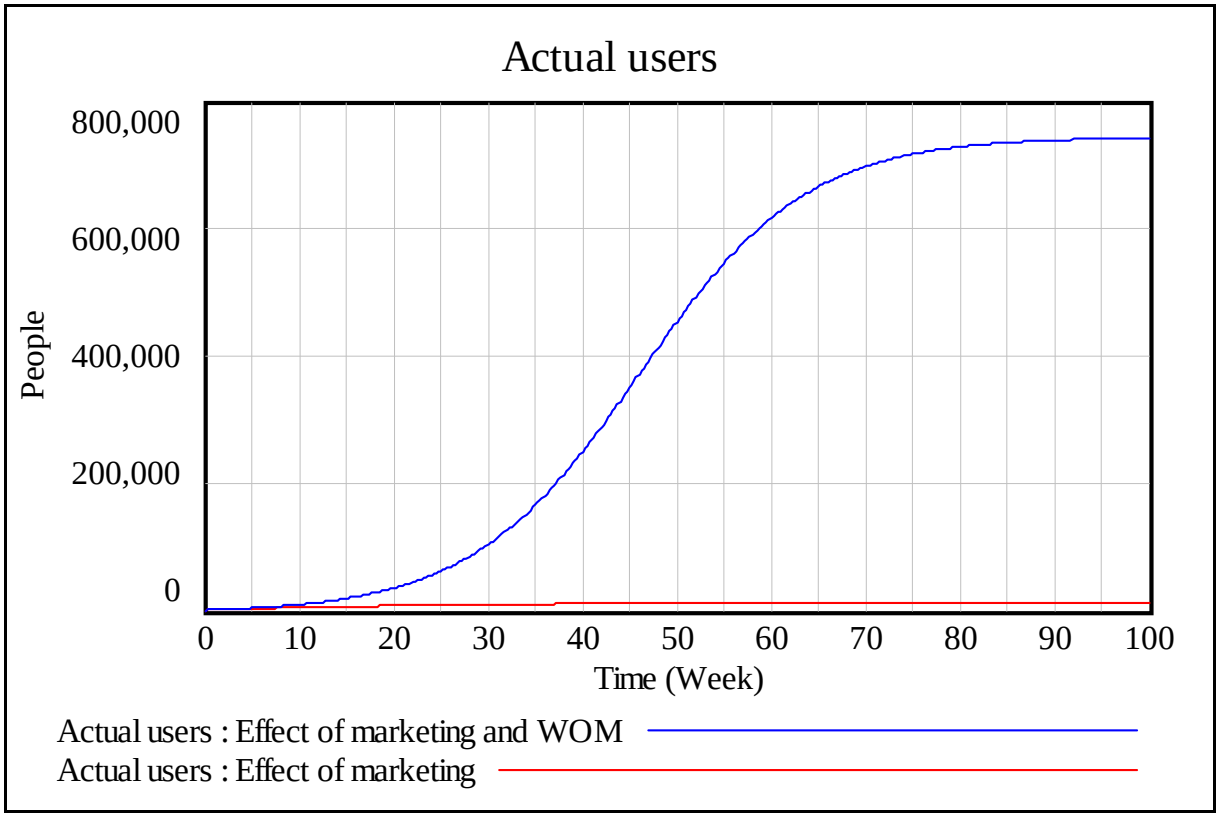
One simple example is the demand for a product, where potential users become users, who in turn may lapse and again become potential users.



From the simple diagram above, John showed how assumptions about marketing a product, in the form of factors such as the proportion of potential users reached by marketing, their rate of conversion to use, and the rate at which existing users lost interest in a product, could produce a curve of the type shown below, in which demand grows rapidly at first and then tails off as users lapse at the same rate as they are recruited.



Add word of mouth as a driver, however, with assumptions about how existing users actively encourage new recruits, and growth accelerates as existing users actively contribute to the recruitment of new ones to deliver a classic S-shaped build-up curve.



This feature, the value of existing users and word of month to attract new users, is a key feature of many product launches and marketing campaigns.

Simple assumptions of this type can generate many of the patterns of behaviour seen in real systems: growth, collapse, S-shaped growth, oscillation and of goal-seeking, where feedbacks in the system tend to restore it to an equilibrium.

John described an example based on the choice between car and public transport. A simple mode choice model can be used to generate the expected proportion of people who would use car and PT for a given trip. If the public transport conditions are made worse, this will cause some mode shift towards car. However this in turn increases traffic flows and worsens congestion, so car becomes less attractive, reducing the proportion of people using car. This is technically difficult to model using more traditional methods, but he showed, using a simple SD model taking into account trip rates, speed-flow curves and the generalised time of public transport and highways, that the process can be described

simply and naturally using SD, generating graphs showing how speeds and travel volumes adjust over simulated time.

EXAMPLES OF SD PROJECTS

John described a number of ways in which he had made use of SD as a consultant. These included telecommunications marketing, boating on UK rivers and canals, simulation of rail businesses in EU Member States, escalator maintenance for London Underground, parking enforcement, car ownership, SimBus (a simulation tool to investigate the impact of different policies on bus use), the Urban Dynamic Model (UDM) and a model of the Steer Davies Gleave consultancy itself. A recent application had been the car fleet model, designed to examine the impact of changes in the technology mix and of pricing on CO_2 emissions and the size and use of the car fleet over time, and specifically to investigate the impact of pricing to encourage use of new technologies and vehicle fuels.

THE URBAN DYNAMIC MODEL (UDM)

The UDM is a general model developed to simulate how an urban area evolves and the interactions between land use, transport, people and employers. It focuses in particular on transport's relationship with employment and regeneration: how transport can be used to support regeneration and reshape the urban economy and the effect of accompanying policies such as road pricing.

The model divides a study area into zones and simulates changes in houses and households, employment premises and businesses occupying them and land use. Zones are linked by various transport modes, with congestion simulated through speed-flow curves, and public transport crowding incorporated through perceived travel times, with a logit structure for mode choice. The model is typically run with time increments of three months over a period of ten years.

A key feature is the attractiveness of locations as a place to live or do business. Attractiveness is affected by transport through employees' access to jobs and employers' access to suppliers, workers and customers. More attractive locations may attract employers or residents, but this effect may be offset by the increasing local scarcity of accommodation or recruits and the effect of congestion on transport. John showed a number of examples of UDM outputs producing

indicators such as population, employment, car mileage, mode shares and average speeds.

WHY USE SD?

John discussed how SD had attracted a number of criticisms over the years, particularly during its early period when accusations included poor modelling of prices, through a cavalier attitude to data and validation ("the parameters are about right") to "building castles in the air". He explained that none of these was intrinsic to SD any more than it was to any other school of modelling and argued that modern authors on the subject offered a thorough and thoughtful approach to model construction, calibration and validation. The pessimistic implication of some critics is that no system should be modelled unless it could be modelled perfectly – an impossible demand.

John argued that SD has a structure and a clear representation of causes and effects. Three excellent software packages (Vensim, ISee and Powersim) are available for building and testing models, including fitting to observed data, sensitivity tests (including Monte Carlo analysis) and even checking physical units. (Every model variable has a physical unit associated with it, and the software will check that the model equations preserve the units consistently. This is a powerful aid to debugging; it will check, for example, that "cars" times "miles per car per year" is treated as "miles per year" and not, for example, "miles per day", the kind of slip that can easily occur in spreadsheet models.)

Finally, there is the International System Dynamics Society (www.systemdynamics.org, or www.systemdynamics.org.uk in the UK). There are also two prizes: the £500 Steer Davies Gleave annual prize for the best piece of work that applies System Dynamics to a problem of wide public interest in the UK, and the annual student prize for the best piece of student work in system dynamics during a given year. Details are on the UK Society website.

QUESTIONS

Peter White said that it had been interesting to see the modelling of marketing and that Stagecoach's approach to telemarketing for bus travel appeared to work. He wondered how much new work was required to identify and calibrate relationships, in the way that speed-flow curves are now understood, and how to fill the gaps in them. John replied that a project on telecommunications marketing had used Stated

Preference (SP) surveys in some areas but had been reliant on educated guesses in others. The UDM itself, however, was data-hungry, and had been populated on a “magpie” basis, drawing evidence from wherever it was available. Households and employment, for example, were linked through a gravity model which had been recalibrated from the travel to work census. Business to business links used functions and parameters that had been calibrated in an earlier study for DfT on “The Impact of Transport on Business Location Decisions”.

Tom Worsley noted that Systems Dynamics does not belong to any paradigm, and wondered whether this was a pro or a con? Department for Transport economists all use Benefit-Cost Ratios (BCRs) for individual projects, but found it much harder to evaluate packages. Could the UDM attach an appraisal module? John noted that the problem of the value of land use had not been solved, but the UDM does calculate time savings benefits and wider economic benefits such as agglomeration and productivity. However, the priority for local authority customers is often employment.

Peter Gordon also wondered whether adequate data is available for models such as the UDM. John replied that a lot of data was generally available in the UK, with the hardest problem always being to find transport data where there is no existing model: the UDM could take information from models such as SATURN or TRIPS. Peter also asked about how different sources could be integrated, and John replied that this was hard to answer specifically, because of the scope of the question, but work was done on this in each application, especially by his colleague Andrew Davies.

David Simmonds noted the relative absence of prices in the model and wondered whether this limited its application to economics. John noted that the absence of explicit pricing had been one of the criticisms of “The limits to growth”, but argued that, while price effects could be explicitly modelled, price was often represented in the UDM by a score rather than an absolute, partly in recognition of the fact that no model could realistically claim to forecast absolute price levels.

David Metz wondered whether there was an underlying assumption about maximising utility or minimising generalised cost. John replied that this was up to the modeller: either assumption could be made implicit or explicit if it had explanatory power. Utility maximisation was not an underlying assumption of system dynamics, but SD models could use it. Dick Dunmore noted that well-established tools such as logit models do not explicitly minimise generalised cost, but they work.

Another question was how long it took the model to reach equilibrium. John replied that the model was dynamic and not compelled to reach equilibrium, although in many cases it would do so. The largest UDM applications to date required around one hour to model ten years, a relatively economical approach compared with highly disaggregate models which take hours or days to run. David Simmonds noted that equilibria may in any case not emerge in many situations where there is a diffusion of information.

D**ick Dunmore** surmised that the core of many current social, planning and political issues was the public expectation that national and local governments should balance three variables – population, housing and employment – at levels which satisfied everyone. John agreed that this was a classic problem of stocks and flows, and he had recently met someone at the Home Office who wanted to model this same problem.

Gregory Marchant noted that “project management exists on S-curves”. Rail also faces the problem of predicting the take-up of new services and there is often a big debate about when equilibrium is reached. Had John used data on the history of previous take-ups? John said that this had been looked at in the Chilean telecommunications work and he had also done some predictive work for Eurostar after 1994 based on the spread of awareness of the new service.

Report by Dick Dunmore

Roads and Reality: a High Level Output Specification?

Stephen Glaister

Director of the RAC Foundation and Emeritus Professor of Transport and Infrastructure, Imperial College London

Arup

22 October 2008

INTRODUCTION

Stephen introduced the December 2007 report published by the RAC Foundation (http://www.racfoundation.org/files/Main%20document.pdf) that looked beyond the 2025 horizon of the Eddington report towards 2050. It was undertaken by Nick Banks, David Bayliss and Stephen Glaister to develop thinking on charges and tax governance in view of climate change and the setting out arguments in view of the current economic situation.

A model of road use was developed that represented all traffic in the UK by various road types, but not representing origins and destinations. That is, trip patterns are taken as fixed but government estimates of value of time and demographic forecasts are taken into account.

GROWTH IN DEMAND

The drivers of traffic growth are population, income and employment, although moderated by congestion. Between 2005 and 2041 it is estimated that population will grow by at least 11%, most of which will be in the east and south of Britain, including London. Also estimated to increase are incomes (doubling) and cars (+44%). This could increase road traffic demand by 43%, which is not inconsistent with the DfT forecast of an increase to 2025 of 29%.

Breaking the forecast increase to 2041 down to traffic types, it was felt that with a fuel price of £1.50 per litre (at today's prices) increases would be as shown overleaf.

Table 1: Growth in traffic to 2041	
Car trips	+24%
Car traffic	+37%
Van traffic	+73%
HGV traffic	+27%
Articulated vehicles	+66%

CONGESTION AND TRAFFIC GROWTH

Congestion has got worse and is predicted to get much worse with the increases above although, in reality, growth will be moderated by shortfall in capacity. Over the past twenty years, annual trunk road construction has fallen while road traffic has continued to increase. The Highway Agency model indicates that congestion will get worse on the main road network with more roads becoming “stressed”. The RAC Foundation work shows that demand will be checked by a lack of capacity.

There were four alternative scenarios of what could happen suggested by Stephen Glaister:

- Let congestion continue to grow unchecked
- Build and widen roads without reforming pricing
- Reform pricing and heavily restrain demand
- Reform pricing to improve efficiency AND additional capacity to preserve mobility

In the speaker’s view, the second and third above on their own would not secure public support but there is very good case for the better outcome achieved by the last, with intelligent pricing and greater efficiency. Increasing strategic road capacity without pricing would allow for extra traffic but there would be increased congestion leading to lower speeds. Pricing alone would deal with 85% of forecast growth and speeds would be 12% higher on motorways and, in urban areas, traffic would be substantially reduced and speeds would increase.

PRICING AND INVESTMENT IN NEW ROADS

Efficient pricing would mean reducing fuel taxes (from 59p to 14p/litre), VED (vehicle excise duty) replaced by a registration fee that could save motorists about £140/year but with a variable mileage charge added. The variable mileage charge, which would be capped, is envisaged to cover congestion, track costs and externalities such as accidents, noise and air pollution.

In the event that road pricing were not introduced the RAC Foundation report differed from the Eddington report, arguing that, with or without road pricing, there is a strong economic case for more investment in strategic roads. Eddington had used standard appraisal criteria within a budget while the RAC Foundation did not consider the budget being capped. Two scenarios were presented of "no pricing" and "efficient pricing", which are illustrated below.

Table 2: Costs and benefits of building extra roads					**£billion p.a.**
	No extra capacity	**+200 lane km pa**	**+400 lane km pa**	**+600 lane km pa**	**+800 lane km pa**
No pricing					
Gross benefit to society	Base	7.48	12.75	16.42	19.55
Cost of additional capacity	Base	1.48	3.0	4.44	5.61
Average benefit to cost ratio of scenario	Base	5.1	4.3	3.7	3.5
Marginal benefit to cost of additional capacity	**-**	**5:1**	**3.5:1**	**2.6:1**	**2.7:1**
Efficient pricing					
Gross benefit to society	22.33	28.29	32.72	36.12	38.38
Cost of additional capacity	0	1.48	3.0	4.44	5.61
Cost of charge collection	4.5	4.5	4.5	4.5	4.5
Average benefit to cost ratio of scenario	5.0	4.7	4.4	4.0	3.8
Marginal benefit to cost of additional capacity	**5.0:1**	**4.0:1**	**2.9:1**	**2.4:1**	**1.9:1**

Whilst extra capacity is still justified, the introduction of pricing does reduce the amount of capacity needed and this is reflected in the BCR.

Road pricing will deal with congestion, while extra capacity restores mobility. It was argued that both are needed to do the job! Up to 600 lane km per annum is justified with or without pricing, and this is not an unreasonable amount based on past provision.

WILL ALTERNATIVE OPTIONS DEAL WITH THE ROAD PROBLEM?

A number of different policy options have been proposed by government. These include hard shoulder running, better management of the road system, travel demand management and local road pricing schemes (e.g. in Manchester). While they could all have a role to play, Stephen Glaister asserted that they could not solve the problem. For example, travel demand management is extremely expensive, has to be renewed and typically results in an average 12%, reduction in traffic.

Rail investment benefits from having a coherent strategy with HLOS (High Level Output Specification) and SoFA (Statement of Funds Available), with independent regulator to ensure that it all adds up. High speed rail proposals have, therefore, to show they are good value for money, genuinely good for the environment and are affordable. This dialogue is not available for roads.

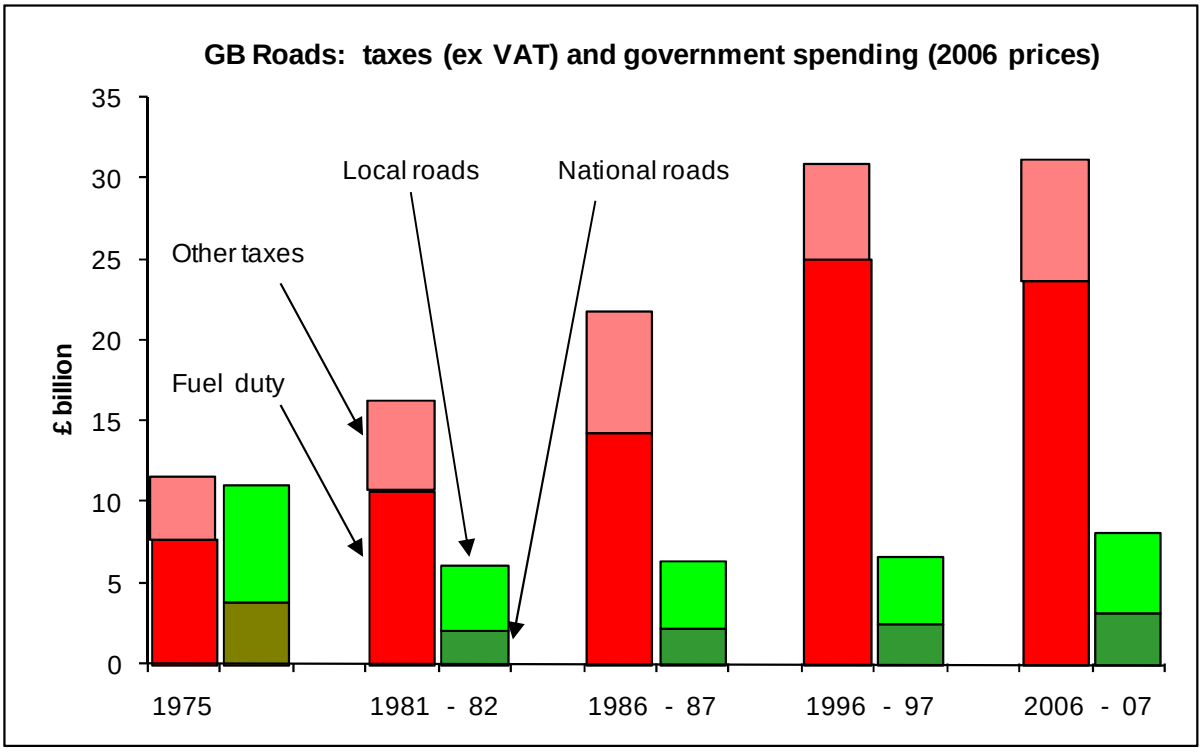
WHY NOT HAVE HLOS FOR ROADS?

The main argument in the RAC Foundation work is that there should be HLOS for roads. The government's rail strategy defines the level of capacity increase, with a definition of who will pay so how could this apply to roads?

Financing of investment, e.g. through PFI or PPP is of no use unless funding has been identified since public authorities have to pay in the end. Unmanageably financed contracts will hamper the ability of these public authorities to meet their obligations economically and efficiently over the long term, preventing investment in infrastructure.

The following graph (Figure 1) demonstrates that income from taxes more than covers government spending on roads and that the difference between revenue and investment has been increasing over the years. This happened by accident – as traffic grew so did tax revenues.

Figure 1: Taxes and investment in roads 1975 – 2006/07



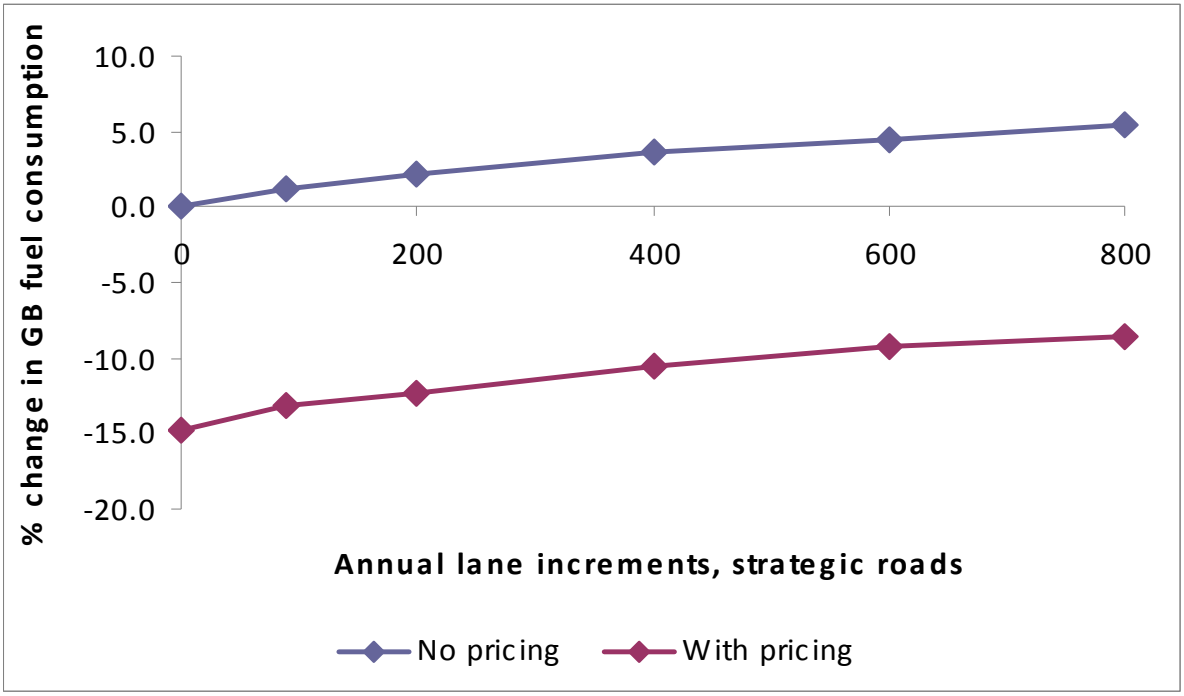
One way round the funding problem is the introduction of pricing, which will provide the funding cash flow. However, to make it acceptable, it will be necessary for the government to say why the money is being raised. The principle of pricing should be to incentivise the efficient use of the system, including carbon and environmental issues, and to fund investment in capacity.

In other regulated industries, the consumer pays for use rather than for ownership. The fee is determined by an independent regulator with publicly declared, objective principles such as economy, efficiency, a fair return to fund capacity investment. The argument is that use of roads and investment should move in the direction of the utilities.

Part of the debate would be about the price of carbon and how people pay for it to secure transport's correct place in the hierarchy of carbon reduction. This would go towards implementing the Stern and Eddington proposals and, unless these are rationalised, there will be a bad outcome in the future.

Appraisals are dominated by value of time at the current official value of carbon. Carbon could be reduced by implementing better technology and introducing more sensible pricing. The effect of introducing pricing on fuel consumption with the different scenarios of road capacity increases is shown in the following graph (Figure 2).

Figure 2: Effect of pricing on fuel consumption



CONCLUSIONS

In conclusion, the RAC Foundation argument is that Great Britain is a rich nation but has not been willing to spend the resources necessary to provide adequate transport infrastructure. The use of PPP and PFI to procure transport needs a careful and dispassionate review to ensure it is not an obstacle.

Roads are the only public utility to be provided by a purely administrative process with little regard for value to users. Pricing, taxation and investment should be moved away from the Treasury's economic and political priorities towards transparent transport policy-related considerations. An efficient pricing mechanism (comparable to utilities) would lead towards solving the problems of funding and efficient usage.

Local communities must be given more freedom to decide their own levels of tax and charge-funded expenditure and the methods of procurement, and be held accountable for them.

There is a need to have the discipline and lessons of public utilities and railways. But, people do not believe what the government will use the money for so new and independent authorities could help reform and rebuild trust.

DISCUSSION AND COMMENT

Peter Gordon (Delta Rail) remarked that the model did not include land use but the trend these days is to build on brown field sites. He asked whether this will constrain car use and whether the mix between car and public transport could be constrained by making car use dearer or public transport cheaper.

Stephen thought that making public transport cheaper or free would cost a lot of money. It would make some difference in London but almost no difference elsewhere. Therefore you have to deal directly with the problem of congestion.

Land use changes are vital aspect that requires more modelling. Trip lengths have risen but the model currently assumes trip lengths are static. More action is required to deliver increased densities and should consider more localised services/shopping to increase equity. In London, if money is kept locally, the cost of travelling will be reduced. There is very little idea of the effect of road pricing on density!

John Dodgson agreed about the need for a regulatory agency and that the rate of return from roads being much higher than for railways. He stated that pricing is trouble for politicians and the net benefits are small with small redistribution effects. Since the rate of return is very good for economic development, pricing needs to be sorted out.

Tom Worsley (DfT) remarked that it is only in the last few years that growth has shown a good rate of return for railways. There needs to be pressure to publish more, especially on crowding values.

Helen Bowkett (Peter Brett Associates) commented that there are so few rail schemes evaluated that can be used but the discipline of HLOS had moved it forward with work in DfT on value for money.

John Cartledge (London Travelwatch) commented that he does not use roads much but his perception of congestion is that it is universal and continuous. If it is relatively isolated in time and space, then it is personal choice if it is suffered especially as we can use IT to know where it is. So, why should we worry about it?

Stephen argued that you are getting a better outcome by pricing to get the best use of people's time. The mystery is why there is not more political weight put on pricing since a lot of people say they are affected a great deal by congestion, which affects not only people but also freight.

A lot of things would change if priced properly – it would increase occupancy from an average of, say 1.4 to 1.6 – i.e. more efficient use of existing assets.

David Metz (UCL) asked what can be said about opportunities for road building in inner London that take advantage of agglomeration benefits.

Stephen: Central London is unique but London is not as dynamic as it could be if there was pricing. HLOS and Crossrail will deliver benefits to central London but the suburbs are getting grimmer and grimmer – pricing across London would give £2-3 billion a year of net income that could be capitalised.

David Starkie (Economics Plus): the general case gets lost in a central London view of the world. He was intrigued by the building blocks of the argument at the beginning of the presentation. If car ownership increases by 44%, who is going to own the extra cars? 75-80% of households already own a car.

Stephen argued that population is growing and household size is falling, leading to an increase in the number of cars owned but growth in traffic is less (see Table 1 above).

Richard Davis (ATOC) remarked that the balance is taxation; the government has to raise a lot of money therefore there is a high rate of tax. Taxing cars and fuel has evolved as an effective, cheap way of raising revenue. If it was narrowed then other parts of the tax system would have to compensate.

Stephen absolutely agreed. In economic terms, it is an environmental / carbon emphasis compared to raising lots of money.

David van Rest said that most congestion is in the cities where most journeys begin and/or end. If inter-urban roads are widened, account needs to be taken of the effect on the urban ends.

Stephen accepted the comment, adding that correctly pricing inter-urban roads will take that problem into account.

Tom Worsley (DfT) pointed out that fuel taxes pay for roads. He was concerned about what the regulator would be regulating since there are many highway authorities. Trunk roads are funded and maintained by regional authorities but other roads by local authorities. This produces severe boundary problems.

Peter White (University of Westminster) pointed out that car ownership over London as a whole had stabilised and bus use had increased in outer London. Additionally, it is important to use saturation effects, which seems to be left out.

Stephen confirmed that all the models include the effects of saturation.

Robert Cochrane (Imperial College) concluded by saying that Stephen had demonstrated that pricing is feasible and is reasonably cheap to collect.

Robert thanked Stephen for the very useful and impressive work and hopes that it now turns into an informed debate.

Report by Laurie Baker

REVIEWS

The views expressed are those of the reviewer and should not be attributed to the Transport Economists' Group

The Limits to Travel – How Far Will You Go by David Metz, Earthscan, 2008 (ISBN: 978-1-84407-493-8)

David Metz's book ranges over many well-known and less well-known issues in transport. Drawing on his wide education, experiences and knowledge, and dipping in and out of economics, he has peppered his text with fascinating asides ranging from a welcome context piece on the mobility of prehistoric humans (and birds and fish), through the philosophy of Chuck Berry to an aside on the effects of the smoking ban on emissions from pub patio heaters.

The main disappointment is the number of lines of argument which end just as they get interesting. On aviation, for example, it takes a couple of paragraphs to note that many users of congested Heathrow are either travelling for leisure or transferring between flights, and that there is therefore more than enough capacity for the "premium business travel with its economic benefits, if this could be at the expense of non-business flying". But it's a big "if", and the book moves on without discussing whether there is market failure, how transfer could or should be prevented or even discouraged, or how slots, the key constraint on capacity, may be more profitably devoted to "thick" leisure routes than to "thin" business ones.

The most interesting strand of thought, picked up (and put down again) several times in the book, is that the journey time savings expected and valued in cost-benefit analysis have not appeared, as people have instead travelled further and faster. "Those in charge – ministers, civil servants, economists, planners and the like – don't understand their business and the needs of the people they are there to serve."

Fine, but if travellers use the journey time savings to reach new destinations, is the failure in the forecasts, or the appraisal, or the market, and in each case what is the cure?

There is evidence that travel time per head is broadly static, and that so is the total number of trips per head, suggesting that the issue is not one of trip generation (more trips) but distribution (longer trips). Could distribution models be adjusted or recalibrated to redistribute a constant total travel time? If so, how should appraisal models be changed? Are

the costs of longer consumer journeys offset by shorter or coarser supplier chains?

Again, it is not clear where this logic leads, or whether wider conclusions can be drawn. Interestingly, rail capacity increases need have no effect on journey time, suggesting that congestion relief is possible without incentivising longer journeys. Could or should road capacity improvements be accompanied not by demand management measure to "lock in" the journey time savings, but by speed limits to allow more to travel the same distances at the same (but more predictable) speed?

There are puzzling Americanisms – "curb" for "kerb" – and the few charts could have made their points more imaginatively. Overall, however, the book fascinated me, even though it repeatedly stopped just as it was getting most interesting. Read it not for the answers but for the questions, and the thoughts that they provoke.

Reviewed by Dick Dunmore

Aviation and Tourism. Implications for Leisure Travel edited by Anne Graham, Andreas Papatheodorou & Peter Forsyth, Ashgate, 2008 (ISBN: 13:978-0-7546-7187-9)

This book is a collection of 26 essays by academics and experts in their field looking which look at aviation, leisure tourism and the link between them. The editors note in their preface 'their surprise at the failure of academia, governments, industry and other stakeholders to fully recognise and appreciate the close and complex relationships which exist between tourism and aviation particularly where leisure travel is concerned'.

Your reviewer would certainly agree that the tourism industry does not get the attention it deserves considering its importance to the economy - and lets not forget the importance of holidays and breaks to individuals. It accounts for a larger proportion of GDP and jobs in the UK than agriculture. He is less certain that the link between aviation and tourism is not appreciated.

The essays have been grouped into six main areas:

- Leisure travel demand
- Regulation and Government policy

- Airline issues
- Implications for airports
- Economic and environmental impacts
- Destination case studies

These cover a wide range. It is perhaps inevitable that there is a chapter covering sustainable tourism. How long until a book like this requires a whole section?

The destination case studies are very interesting covering seven countries or areas such as the Middle East or Africa. All seven are long haul destinations (for a European market). It might also have been interesting to have a chapter devoted specifically to the short/weekend break market, which is growing at a rapid rate.

The chapters are generally well written and give a good overview of the pertinent issues.

The book is clearly aimed at students rather than the more advanced reader looking for detailed critiques of his subject. It is a very workmanlike book that covers its area well and provides a good overview of the area it sets out to cover. It is will doubtless find itself on many students' reading lists. It is recommended for general readers who like to gain an appreciation of the aviation and tourism industries and the links between them.

Reviewed by Peter Gordon

TEG Committee 2008-2009

Chairman

Laurie Baker
+44 (0)20 7974 5962
laurie.baker@btinternet.com
Environment Department, Camden Town Hall, Argyle Street, London WC1H 8EQ

Secretary, Webmaster and Programme Coordinator

Dick Dunmore
+44 (20) 7910 5612
dick.dunmore@sdgworld.net
Steer Davies Gleave, 28-32 Upper Ground, London SE1 9PD

Treasurer and Membership Secretary

Gregory Marchant
+44 (0)1273 621522
gregorymarchant.teg@btinternet.com
4 Seymour Square, Brighton BN2 1DP

Editor

Peter Gordon
+44 (0)870 190 1424
peter.gordon@deltarail.com
DeltaRail, Central House, Upper Woburn Place, London WC1H 0JN

Publicity

Tom Cohen
+44 (0)20 7919 8500
tom.cohen@sdgworld.net
Steer Davies Gleave, 28-32 Upper Ground, London SE1 9PD

Committee members without portfolio

Peter Burgess
+44 (0)121 213 3646
peter.burgess@arup.com
Arup, Blythe Gate, Blythe Valley Park, Solihull, West Midlands, B90 8AE

Kevin Cheung
+44 (0)20 7636 1531
kevin.cheung@arup.com
Arup, 13 Fitzroy Street, London W1T 4BQ

Tom Cohen
+44 (0)20 7919 8500
tom.cohen@sdgworld.net
Steer Davies Gleave, 28-32 Upper Ground, London SE1 9PD

Jeremy Drew
+44 (0)20 7354 3451
jeremy.drew@btinternet.com
Drew Management Consultants, 63 Aberdeen Road, London N5 2XB

Julie Mills
+44 (0)20 7956 405003
julie.mills@millsconsultants.co.uk
Mills Consultants

Tom Worsley
+44 (20) 7944 4880
tom.worsley@dft.gsi.gov.uk
Department for Transport, 76 Marsham St, London SW1P 4DR

TEG TRANSPORT ECONOMISTS' GROUP

The Transport Economists' Group, formed in 1973, provides a forum for people involved in transport economics to meet regularly and discuss matters of mutual interest. Membership is open to economists working in transport and others whose work is connected with transport economics.

The aim of the Group is to improve the quality of transport management, planning and decision making by promoting lectures, discussions and publications related to the economics of transport and of the environment within which the industry functions.

Meetings are held every month from September to June (except December) at Arup's Central London HQ at 13 Fitzroy Street. The meetings consist of short papers presented by speakers, drawn from both within the Group's membership and elsewhere, followed by discussion.

The Group's Journal, "The Transport Economist", is published three times a year reporting on meetings and other activities of the Group. It reviews recent publications of interest and contains papers or short articles from members. The Editor welcomes contributions for inclusion in the journal, and can be contacted at peter.gordon@deltarail.com

The current membership of over 150 covers a wide range of transport modes and types of organisation. Members are drawn from transport operators, consultants, universities, local and central government and manufacturing industry. All members are provided with a full membership list, updated annually, which serves as a useful source of contacts within the profession. Applications from people in all sectors are welcome.

Applications for membership should be made on a form obtainable from the Membership Secretary at gregorymarchant.teg@btinternet.com.

Alternatively, an application form can be downloaded from the Group's website: www.transecongroup.org.uk.

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The Transport Economists' Group

Details of meetings are provided on our website at

http://www.transecongroup.org.uk/meetings.htm

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